

VIETNAM

By Gert-Jan Stads and Nguyen Viet Hai

This brief reviews the major investment and institutional trends in Vietnamese agricultural research since the early 1990s, using recent data collected under the Agricultural Science and Technology Indicators (ASTI) initiative (IFPRI–MARD 2004-05).¹

INTRODUCTION

In the late 1980s the Vietnam government embarked on economic and political reforms that transformed the country from a centralized planned economy to a market economy with a socialist orientation and launched the country on a path of tremendous economic growth. From 1994 to 2003, growth in gross domestic product (GDP) averaged 7.3 percent per year, making Vietnam one of Asia's fastest-growing economies. Thanks to this rapid economic growth, the share of people living below the poverty line (US\$2 per day or less) fell by nearly half, from 58 percent to 33 percent, between 1993 and 2002 (World Bank 2005).

Vietnam is a largely agrarian society, with two-thirds of the labor force working in agriculture, forestry, and fisheries (FAO 2005). Although rice, the country's single most important crop, has always played an important role in the Vietnamese economy, the economic reforms shifted agricultural production away from subsistence towards cash cropping. As a consequence, Vietnam has gone from being a rice importer in the 1980s to the world's second largest rice exporter, after Thailand, at present. In addition, in recent years, Vietnam has routinely been the world's second- or third-largest exporter of pepper, coffee, rubber, and tea. Fishing and aquaculture also constitute an important industry, and marine products are another major export. Yet despite the rapid growth of the agricultural sector, the

Table 1—Composition of agricultural research expenditures and total researchers, 2002–03

Type of agency	Total spending, 2002		Total research staff, 2003 (fte's)	Share		Agencies in sample ^a (number)
	2000 Vietnamese dong (billions)	2000 international dollars (millions)		Spending (percent)	Researchers	
Public agencies						
Government						
MARD ^b	114.9	41.1	2,109.1	56.1	71.2	28
MF ^b	44.8	16.0	215.5	21.9	7.3	4
CRDI ^b	0.7	0.2	44.5	0.3	1.5	1
Higher education ^c	38.6	13.8	581.7	18.8	19.6	7
Subtotal	199.0	71.3	2,950.8	97.2	99.6	40
Private enterprises	5.8	2.1	13.0	2.8	0.4	1
Total	204.8	73.3	2,963.8	100	100	41

Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).

^a See note 2 for a list of the 41 agencies included in this sample.

^b The 33 government agencies combined employed 4,529 researchers. Staff with BSc degrees were estimated to spend 50 percent of their time on research, resulting in a total of 2,369.1 fte researchers in the government sector.

^c The 1,789 staff at the higher-education agencies spent between 30 and 40 percent of their time on research, resulting in 582 fte researchers.

KEY TRENDS

- During 1991–2003 total agricultural researcher numbers in Vietnam showed a steady increase. Public agricultural R&D expenditures, in constant prices, nearly tripled during 1996–2002.
- The 28 agencies with an agricultural R&D mandate under MARD accounted for more than 70 percent of Vietnam's agricultural research staff in 2003 and nearly 60 percent of total R&D investments in 2002.
- Despite rapid developments in average qualifications of agricultural research staff, degree levels in Vietnam are still among the lowest in Asia.
- The large number of agricultural research agencies under MARD—often with overlapping mandates—prompted a series of mergers in September 2005, with a second round of mergers scheduled for 2008. Agricultural R&D remains geographically centralized, preventing R&D from being closely connected with Vietnam's rural development programs.
- The involvement of the private sector in Vietnam's agricultural R&D is minimal.

ABOUT ASTI

The Agricultural Science and Technology Indicators (ASTI) initiative comprises a network of national, regional, and international agricultural R&D agencies and is managed by the International Service for National Agricultural Research (ISNAR) division of the International Food Policy Research Institute (IFPRI). The ASTI initiative compiles, processes, and makes available internationally comparable data on institutional developments and investments in public and private agricultural R&D worldwide, and analyses and reports on these trends in the form of occasional policy digests for research policy formulation and priority setting purposes.

Funding for the ASTI initiative was provided by the CGIAR Finance Committee/World Bank, IFPRI unrestricted funding, and the U.S. Agency for International Development (USAID).

share of agriculture in Vietnam's GDP actually fell from 38 percent in 1990 to 22 percent in 2003, owing to the even more rapid growth of the manufacturing and service sectors (World Bank 2005).

Agricultural development in Vietnam still faces many constraints and challenges. Investments in the agricultural sector are low, technologies for the most remote and poorest communities are often non-existent, rural infrastructure is underdeveloped, land markets are imperfect, and pressures on the country's natural resources and the environment are mounting. In *Vietnam's Strategy for Socio-Economic Development for the Period 2001–2010*, the national government places a high priority on agricultural and rural development and stresses the importance of investments in agricultural research and extension, stating that improvements in these areas are the driving forces behind poverty reduction, economic growth, and national development (MARD-FAO 2001).

Institutional Developments in Agricultural Science and Technology

We identified 43 agencies involved in agricultural research and development (R&D) in Vietnam in 2003.² During that year, the 41 agencies for which data were available employed 2,964 full-time equivalent (fte) researchers and spent 205 billion Vietnamese dong in constant 2000 prices—equivalent to 73 million international dollars in constant 2000 prices (Table 1).³

The Ministry of Agriculture and Rural Development (MARD) supervises the majority of agricultural R&D undertaken in Vietnam. MARD maintains an agricultural R&D system for crops, livestock, water resources, and land use planning. Until September 2005 32 agencies were placed directly under MARD or under state-owned enterprises under MARD's control. Four of these agencies did not have a research mandate and are therefore excluded from further data analysis in

this brief.⁴ In 2002–03 the 28 MARD agencies involved in agricultural R&D accounted for more than 70 percent of Vietnam's agricultural research staff and close to 60 percent of agricultural research spending.⁵ In September 2005 mergers reduced the number of agricultural R&D agencies under MARD to 12. The details of these mergers will be discussed later in this brief. Given that the data in this brief cover the period 1991–2003, all MARD-related information pertains to the 28 agricultural R&D agencies in existence before the mergers.

Some of the agencies under MARD were created in the 1950s and 1960s, whereas others were established as recently as 2003 (see box entitled *A Short History of Government-Based Agricultural Research* below). Geographically, MARD's research network was extremely centralized, with 20 of the 28 MARD research agencies headquartered in or near Hanoi. Most of the remaining agencies were in or near Ho Chi Minh City. Collectively, the 28 agencies operated 89 research centers and 18 research stations, but most of these centers and stations were close to their agency's headquarters and therefore exacerbated the pronounced regional imbalance. MARD's geographically centralized research activities make it difficult for R&D to be closely connected with the rural development programs for the country's various agroecological zones and to address the poverty and environmental sustainability concerns of farmers in these zones (MARD-FAO 2001). The recent mergers do not appear to have addressed this issue.

The governance of the MARD research system is complex (and remained so after September 2005), being spread across several units located in different ministries. Responsibilities are shared between the Department of Science and Technology (DOST) of the Ministry of Science, Technology, and the Environment (MOSTE), as well as the Department of Science, Technology, and Quality Control (DSTQC), the Organization and Personnel Department (OPD), and the Department of Finance and Administration (DFA) of MARD. The directors of the 28 MARD agencies reported directly to the Minister of

A Short History of Government-Based Agricultural Research

Under French colonial rule, agricultural production and development in Indochina were largely overlooked. When Vietnam gained independence in 1945, the new national government not only assigned a high priority to food production in order to meet rising domestic demand, but also gave increased attention to agricultural R&D. Vietnam's first agricultural research agency—the Crop Production Research Institute—was established in 1952. Later renamed as the National Institute of Agricultural Sciences (INSA), the agency focused largely on cropping patterns and agricultural systems for the country's various agro-ecological zones.

During the 1960s several INSA research departments broke away from the main institute. This is how the Food Crop Research Institute (FCRI), the Industrial Plant Research Institute (IPRI), the Animal Husbandry Research Institute (AHRI), the Veterinary Research Institute (VRI), the Soil Science and Fertilizers Research Institute (SFRI), and the Plant Protection Research Institute (PPRI), among others, emerged. All these institutes were headquartered in the northern part of the country, in or near Hanoi. When the war between the United States and Vietnam ended in 1975 and the southern part of the country was reunited with the north, the Ministry of Agriculture decided to open two new institutes in the south: the Institute of Agricultural Technology in Ho Chi Minh City and the Omon Rice Research Institute for the Mekong River Delta area.

Various research centers were established in the 1980s, including the Agricultural Genetic Center, the Maize Research Center, the Mulberry and Sericulture Research Center, the Veterinary Drug Testing Center, and the Scientific Technological Information Center. Certain state-owned enterprises also created applied research centers that focused largely on crops and livestock and had dual scientific research–production mandates. Among these centers were the Coffee Research Institute (belonging to the Coffee United Enterprises), the Cotton Research Center (under the Cotton Company), the Vegetable Research Center (under the Central Company of Vegetables), and the Poultry Center (part of the Central Poultry United Enterprises). Gradually, these agencies were placed under MARD and underwent various name changes. By 2003, 28 different research agencies had been placed under the MARD umbrella, and in September 2005, mergers reduced this number to 12.

Vietnam's fisheries research began in 1963 with the establishment of the Research Institute of Aquaculture No. 1, the country's principal brackish-water fish research agency. Two additional fisheries research institutes were created in 1975 and 1984: the Fisheries Research Institute in the South Coastal Region (later renamed RIA No. 2) and RIA No. 3.

Agriculture. MOSTE influences the direction of agricultural research in Vietnam through its national agricultural research program. This program consists of various national projects (on average between 12 and 14). The national rice project, for instance, distributes responsibility for rice breeding in different environments across MARD institutes, aiming to overcome duplication problems (MARD-FAO 2001).

The 28 MARD research agencies varied largely in size. In 2003, 13 agencies employed 50 fte researchers or fewer, 7 agencies employed between 50 and 100 fte researchers, 3 agencies had between 100 and 150 research staff, 4 had between 150 and 200, and 1 had more than 200.

With 207 fte researchers in 2003, the National Institute of Animal Husbandry (NIAH) was Vietnam's largest agricultural research agency in terms of research staff. Established in 1952, the Hanoi-based NIAH focuses its activities on the selection and use of animal genetic resources, the study of animal feed resources and feed processing, and on biotechnology to improve animal breeding and nutrition. Research is spread over 11 departments and 9 research centers. Poultry and dairy research hold a prominent position at NIAH. The Forest Inventory and Planning Institute (FIPI), employing 182 fte researchers in 2003, conducts research on physical and socioeconomic conditions relevant to forestry development. FIPI, established in 1961 and headquartered in Hanoi, consists of six functional sections, three technical centers, and six sub-institutes. The 176 fte researchers at the Institute of Agricultural Engineering and Post-Harvest Technology (IAEPHT) carry out basic and applied research on post-harvest activities in agriculture as well as on agricultural machinery and corresponding technological procedures. The Hanoi-based institute was established in 2003, when the Vietnam Institute of Agricultural Engineering (VIAE) and the Post-Harvest Technology Institute (PHTI) merged. The Forest Science Institute of Vietnam (FSIV) with 169 fte researchers in 2003, focuses largely on scientific and technological silvicultural research, forest economics, and forestry organization and management. Like FIPI, FSIV has research stations in Vietnam's various agroforestry zones, though the bulk of the institute's research activities take place in Hanoi. The 160 fte researchers at the Vietnam Agricultural Science Institute (VASI) concentrate their research efforts on crops, mainly rice and soybeans. Research activities are spread out over eight research centers scattered across the country.

The remaining 23 agencies under MARD each employed 150 fte researchers or fewer in 2003 and had varying research orientations. Fifteen of these agencies focused on crops and crop protection. Besides NIAH (and to a limited extent the Institute of Agricultural Science in the South [IAS]), the National Institute of Veterinary Research (NIVR) is MARD's only other government agency with a veterinary research mandate. Natural resources research (predominantly water research) takes place at three agencies. Other MARD research agencies include the Bee Research and Development Center (BRDC), the Central Sericulture Research Center (CSRC), the National Institute for Agricultural Planning and Projection (NIAPP), and the Institute of Agricultural Economics (IAE).

In September 2005 the entire MARD agricultural R&D system was reorganized and the total number of agricultural R&D agencies under direct MARD control reduced from 28 to 12.⁶ The Agricultural Genetics Institute (AGI), the Ba Vi Coffee Research Center (CRC), CSRC, the Food Crops Research

Institute (FCRI), NIAPP, the National Institute for Soils and Fertilizers (NISF), the National Maize Research Institute (NMRI), the Research Institute of Fruits and Vegetables (RIFAV), the Tea Research Institute of Vietnam (TRIV), and VASI were merged into the Vietnam Academy of Agricultural Sciences (VAAS). The Institute of Sugarcane Research (ISCR) was incorporated into IAS. The Western Highlands Agro-Forestry Science and Technology Institute (WASI) and its subsidiary the Lam Dong Agro-Forest Research Center (LDAFRC) became the Highland Agricultural Research Institute (HARI), and IAE was renamed the Institute of Agricultural Policy and Strategy (IAPS). FIPI, the Institute of Water Resources Planning (IWRP), and NIAPP are no longer under the science and technology (S&T) budget lines of the Vietnamese government. This means that MARD still provides budget for the research activities of these agencies, but not for salaries and overhead costs. In addition, the Rubber Research Institute of Vietnam (RRIV) and BRDC were placed under the Vietnam Rubber Corporation and the Vietnam Bee Company, respectively. A further round of mergers scheduled for 2008 will reduce the total number of agricultural R&D agencies under direct MARD control to six, all of which will be headquartered in Hanoi.⁷

We identified five other government agencies involved in agricultural R&D that are not placed under MARD. Four of these fall under the Ministry of Fisheries (MF). Combined, these five agencies accounted for just 9 percent of Vietnam's agricultural researchers but close to a quarter of the country's total agricultural R&D spending. As mentioned, since the early 1990s, with the development of the shrimp industry and sea farming, aquaculture has contributed considerably to fish production for domestic consumption and export. The three Research Institutes of Aquaculture (RIA No. 1, No. 2, and No. 3) employed a combined total of 172 fte researchers in 2003. The three institutes conduct research on breeding, farming practices, diseases of freshwater and saltwater fish species, processing and storage of fisheries products, and feed and nutrition for fish. Each RIA has a different geographical focus: RIA No. 1 concentrates on the northern part of Vietnam, RIA No. 2 on the South, and RIA No. 3 on central Vietnam. In 2003 the Research Institute of Marine Products (RIMP), also under MF, employed 44 fte researchers, who focus their research efforts on marine resources, the sea environment, biodiversity, and sea conservation. The fifth non-MARD agency is the Cotton Research and Development Institute (CRDI) under the Ministry of Industry. Research staff at CRDI focus primarily on cotton and fibrous crops.⁸ In 2003 the institute employed 45 fte researchers.

Nine higher-education agencies conduct agricultural research in Vietnam. The seven universities for which data were available employed 582 fte researchers in 2003, representing one-fifth of the country's total agricultural research staff that year.⁹ Vietnam has four agricultural universities under the Ministry of Education and Training (MOET): the Hanoi Agricultural University (HAU), the Thai Nguyen Agriculture and Forestry University, Hue University of Agriculture and Forestry, and the University of Agriculture and Forestry of Ho Chi Minh City. In addition, two specialized universities (the Water Resources University [WRU] and the Vietnam Forestry University, both of which are under MARD) and one faculty (the Faculty of Agriculture of the University of Can Tho) are

responsible for a sizable share of agricultural research in the country's higher-education sector. HAU is Vietnam's principal agricultural university and regarded by many as the country's best. Established in 1956, the university has comprehensive coverage of the agricultural disciplines in its eight faculties: the Faculty of Agronomy and Agricultural Resources Environment Management, the Faculty of Animal Husbandry and Veterinary Medicine, the Faculty of Post-Harvest Technology and Food Processing, the Faculty of Farm Engineering and Rural Electricity, the Faculty of Economics and Rural Development, the Faculty of Land Resources and Environment, the Faculty of Technical Teachers Training, and the Faculty of Post-Graduate Studies (HAU 2004). In 2003 125 fte agricultural researchers were employed at HAU's eight faculties. The University of Agriculture and Forestry of Ho Chi Minh City was founded in 1955, and its research addresses the agroecology of the southern part of Vietnam. In 2003 the university's 98 fte research staff conducted research on a wide range of topics, including crops, livestock, fisheries, and post-harvest issues. The Thai Nguyen Agriculture and Forestry University (TNAFU), established in 1970, covers the ecology of the mountainous areas in the North of Vietnam. The university has four faculties, and the research emphasis of its 53 fte researchers is applied crop and livestock research. Hue University of Agriculture and Forestry, founded in 1967, serves the needs of the 13 coastal provinces in the center and south of the country. In 2003 it had 66 fte researchers spread over five faculties. As their names indicate, research staff at the Water Resources University and the Vietnam Forestry University focus largely on water resources and forestry. In 2003 these universities employed 132 and 65 fte research staff, respectively.

Given that nearly 100 percent of Vietnam's companies were government owned until recently, private sector involvement in agricultural R&D has been minimal. We identified only one private-sector agricultural R&D agency operating in Vietnam: East-West Seed, a Dutch hybrid vegetable seed producer, which accounted for 3 percent of the country's agricultural R&D expenditures in 2002. The company opened its Vietnam branch near Ho Chi Minh City in 1998 and employed 15 fte researchers in 2004. These researchers focus largely on bitter gourds, tomatoes, and hot peppers. In addition, government research agencies collaborate with the private sector. FSIV, for instance, conducts research on wood-drying and sawing technologies on behalf of foreign furniture companies. Further liberalization and privatization in the Vietnamese economy, combined with a move toward higher-value crops, could step up private sector involvement in the future.

Vietnam's agricultural research agencies also collaborate among themselves. In the MOSTE-financed research projects, the various MARD institutes have proven their ability to coordinate their research activities. Collaboration between Vietnam's higher-education sector and MARD, however, has had mixed results. Many observers ascribe this problem to the way the Vietnamese government has assigned responsibilities for agricultural R&D to different ministries and to insufficient collaboration between MARD and MOSTE. Interactions in the forestry and water resource sectors are straightforward because the relevant government agencies and universities all fall under MARD. But the often-heard concern about duplication of research by two or more MARD agencies is sufficient proof that the institutes do not adequately consult each other on their work

plans (MARD-FAO 2001). The recent mergers should have addressed many of these duplication issues. Despite these suboptimal linkages, MARD agencies like IAEPHT, NIVR, NIAH, and the Vietnam Institute for Water Resources Research (VIWRR) reported widespread collaboration with HAU and the University of Agriculture and Forestry of Ho Chi Minh City. The MARD agencies also maintain close relationships with numerous research institutes around the world. NIAH, for example, conducts joint research with the International Livestock Research Institute (ILRI), the French Agricultural Research Centre for International Development (CIRAD), and various Asian, Australian, and European universities. The research agencies with a focus on rice reported extensive collaboration with the International Rice Research Institute (IRRI) and national rice research institutes in other Asian countries. WASI, CRC, and the National Institute of Plant Protection (NIPP) work closely with the International Agricultural Centre (IAC) on training in coffee variety selection, with the Indian Coffee Board on the practice of producing coffee varieties, and with Colombia on the purchase of new processing equipment. RRIV works closely with the International Rubber Research and Development Board (IRRDB) and national rubber research institutes in various Asian countries. RIFAV conducts joint research with the World Vegetable Center (AVRDC, Taiwan), CIRAD, horticultural research institutes in China and Thailand, the Australian Centre for International Agricultural Research (ACIAR), and the Fruit Research Institute of Japan. The majority of the remaining MARD agencies are also involved in joint programs with foreign research bodies (MARD-FAO 2001). The aquaculture institutes conduct joint research projects with RIMP and Vietnamese and foreign universities, as well as with the Food and Agriculture Organization of the United Nations (FAO) and the WorldFish Center. HAU and the University of Agriculture and Forestry of Ho Chi Minh City maintain collaborative programs with academic institutions in a wide range of Asian and developed countries.

HUMAN AND FINANCIAL RESOURCES IN PUBLIC AGRICULTURAL R&D

Overall Trends

Vietnam's fte researcher totals and actual research staff numbers vary largely. Most government agencies employ a very large number of research staff holding BSc degrees. We estimate that the strongest 50 percent of these BSc holders fulfill a scientific role, while the other 50 percent work mostly as technicians and research support staff. We therefore projected that the 2003 total of 4,059 MARD research staff represented 2,109 researchers when expressed in full-time equivalents. From 1991 to 2003, the total number of public fte agricultural researchers in Vietnam increased by an average of 4.2 percent per year, from 1,862 to 2,951 (Figure 1a). Annual growth was higher in the second half of this period (5.6 percent) than in the first half (1.5 percent), mainly because of increased government support to agricultural R&D, leading to accelerated research staff recruitment. The number of fte research staff members in the higher-education agencies grew more slowly—1.9 percent annually—than in the government agencies during 1991–2003. MOET financing to agricultural R&D did not grow as fast as MARD financing

throughout the sample period, ultimately resulting in lower recruitment levels at the higher-education agencies.

These average growth rates mask the variations that exist between higher-education agencies. The University of Agriculture and Forestry in Ho Chi Minh City saw its research staff more than quintuple during 1991–2003. Growth was particularly strong during 2002–03, when the university's fte total rose from 61 to 98 as a result of the creation of the new faculties of Postharvest Technology and Biotechnology. TNAFU and the Faculty of Agriculture of the University of Can Tho, on the other hand, made sharp cuts in their permanent research staff owing to falling student enrollment.

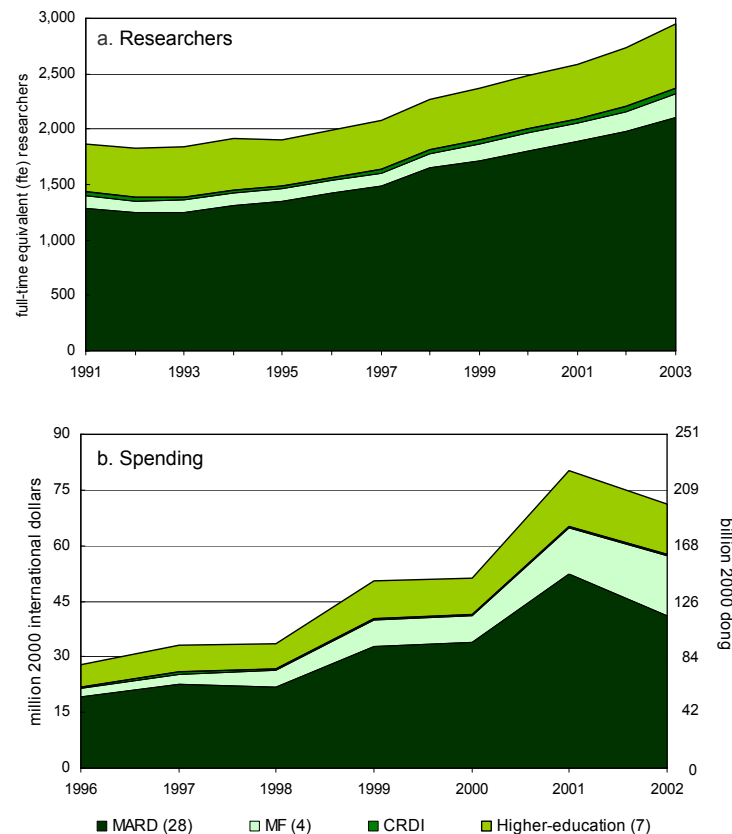
The 28 MARD agencies combined saw their research staff totals rise by 4.8 percent annually during 1991–2003. Not a single MARD agency experienced a decline in its total research staff, and five agencies reported a doubling or more of their research staff (CRC, the Southern Institute of Water Resources Research [SIWRR], IAEPHT, NIAH, and NMRI). These increases by and large represent rises in the number of contract staff. The Vietnamese government decides on the number of MARD permanent research staff, depending on the country's overall research needs. MARD subsequently allocates research staff to each of the research agencies under its umbrella. Generally speaking, the number of permanent staff allocated to each institute remains more or less fixed. Each research agency can, however, recruit staff on a long- or short-term contract basis, depending on the agency's research needs.

Research staff at the five government agencies under ministries other than MARD increased by 5.3 percent per year during 1991–2003. The three RIA institutes in particular experienced significant growth. In recent years the fisheries and aquaculture sector has proved to be a very profitable export sector, and more and more resources are being directed toward R&D in this sector. RIA No. 3 saw its fte researcher totals increase more than fivefold when the agency was upgraded from a research center to a research institute, which are allowed more permanent staff than research centers. Also during this time frame, research staff at RIA No. 1 rose by 70 percent and staff totals at RIA No. 2 doubled.

The Vietnamese government has given agricultural and rural development top priority in its resource allocations for 2001–2010. The government has strengthened investments in agricultural production in recent years, especially in irrigation, seed, and other agricultural materials supply systems in order to increase the country's cultivation intensity. It has also accelerated investments in agricultural R&D. Between 1996 and 2001 Vietnam's total public agricultural R&D spending increased by 20 percent annually, from \$28 million to \$80 million (Figure 1b). In 2002 total expenditures fell back to \$71 million. The 2001 peak can be explained by large capital investments at NIAH. During that year (and the two preceding years), NIAH invested heavily in the construction of its Hanoi headquarters. Upon the completion of this construction, NIAH's total spending dropped sharply.

In addition to increases in research staff, Vietnam's fisheries and aquaculture sector have seen increases in total R&D expenditures. During 1996–2002 spending increased nearly 10-fold at RIMP, nearly 7-fold at RIA No. 3, more than 6-fold at RIA No. 1, and more than 4-fold at RIA No. 2. Twenty-five of the 28 MARD agencies experienced growth in R&D spending

Figure 1—Public agricultural R&D trends, 1991–2003

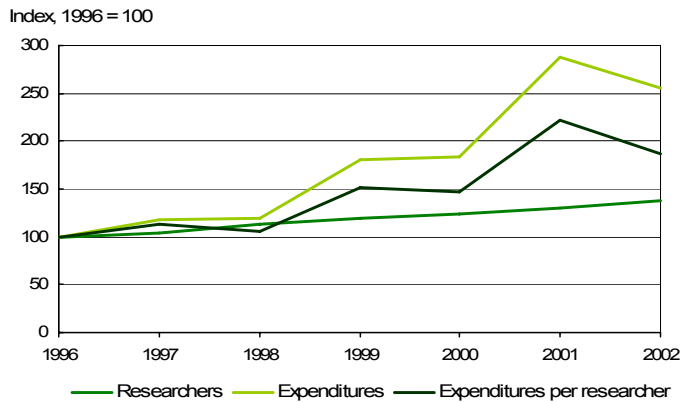


Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).
Notes: See Table 1. Figures in parentheses indicate the number of agencies in each category. Expenditures for the higher-education sector in our sample are estimates based on average expenditures per researcher at the government agencies. Underlying data are available at the ASTI website (www.asti.cgiar.org).

during 1996–2002, but growth rates varied widely from one agency to the next. CRC, AGI, and NIAH saw their research expenditures more than quintuple, whereas IAS, RRIV, and LDAFRC experienced modest negative growth in their real spending levels. Growth in agricultural R&D spending continued beyond 2002. During 2002–05, total salary and overhead spending at the 28 MARD agencies increased by more than 20 percent in real terms. MOSTE funding for national research programs also increased throughout this period, though exact amounts were unavailable.

Thanks to Vietnam's combined growth in researcher numbers and expenditures, average spending per scientist more than doubled, from \$14,000 in 1996 to \$31,000 in 2001 (Figure 2). By 2002 average expenditures per researcher had fallen somewhat to \$26,000 as a result of the decline in spending by NIAH. Despite the impressive growth rates in total agricultural research expenditures for many agencies, average expenditures per researcher in Vietnam are still low compared with those in many other Southeast Asian countries. Yet there is considerable variation among the sample agencies. Unsurprisingly, spending per researcher at the agencies under the Ministries of Fisheries and Industry (\$91,000) was much higher than at the MARD agencies (\$21,000). RIA No. 1, RIMP, and AGI all had average spending levels above \$100,000 in 2002, largely as a result of high capital investments by these agencies.

Figure 2—Trends in public expenditures, researchers, and expenditures per researcher, 1996-2002



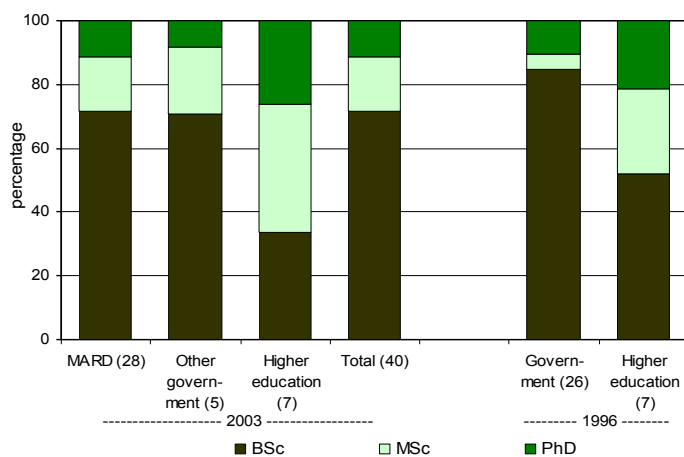
Source: See Figure 1.

Notes: See Figure 1.

Human Resources

In 2003, 36 percent of Vietnam's researchers were trained to the postgraduate level and 14 percent held PhD degrees (Figure 3). As already explained, this share of postgraduate researchers would be lower if research staff were not expressed in full-time equivalents. Vietnam's seven higher education agencies reported a higher share of research staff trained to the postgraduate level (66 percent) than did MARD and the other government agencies (29 percent each), and this finding is consistent across most countries in the region and developing countries around the world. While the share of PhD holders is on the low side, MARD sees the training of current BSc holders to the MSc level as the most pressing task. MARD is carefully choosing the research areas in which it lacks adequately qualified staff and sending increasing numbers of staff abroad for MSc and PhD-level training.

Figure 3—Educational attainment of researchers by institutional category, 1996 and 2003



Source: Compiled by authors from ASTI survey data (IFPRI-MARD 2004-05).

Notes: Figures in parentheses indicate the number of agencies in each category. Seven government agencies are excluded from the 1996 sample due to data unavailability.

Until the late 1980s Vietnamese scientists were largely cut off from their colleagues in the West owing to the country's political isolation after the end of the war with the United States and the establishment of close ties with the Soviet Union. Göhl and Nguyen (1990) stated that this limited exposure of Vietnamese researchers to methodologies developed in the West resulted in costly duplication of research. Libraries of MARD agencies were well equipped with publications from the Soviet Union (in Russian) but usually lacked relevant books and articles from Western countries, international conference proceedings, or publications from countries with agro-climatological characteristics similar to Vietnam's. A total of 20,000 Vietnamese students went to the Soviet Union for training during the 1950s, 1960s, 1970s, and 1980s as part of the Inter-Governmental Soviet-Vietnamese Commission on Economic and Scientific Technical Cooperation. Two thousand of them received a candidate of science degree (equivalent to a MSc) and only 70 a doctor of science degree (equivalent to a PhD). In 1985 alone, 5,000 Vietnamese students were in the Soviet Union for some kind of agricultural training. By 1990 30 percent of all teaching staff at HAU had a degree from a Soviet university. During the 1980s Vietnam's most important research partner outside the Eastern Bloc was France, the country's former colonizer. During that decade 80 Vietnamese trainees were sent to France each year for six- to nine-month training. Certain Vietnamese researchers received PhD degrees as part of this cooperation between the French National Center for Scientific Research (CNRS) and the government of Vietnam (Göhl and Nguyen 1990).

Since 2001 MOET has reserved 100 billion current dong annually for overseas training. This budget allows MARD research staff to apply for fellowships for MSc- or PhD-level training at a foreign university. Applicants must first pass MOET examinations in English and in the subject matter of the degree they plan to pursue. MARD itself does not have an official training program for its research staff, but limited funds are released to scientists working on their theses through research projects and programs. Many additional short-term projects are financed by ACIAR, CIRAD, and the Australian Agency for International Development (AusAID). The exact number of Vietnamese agricultural scientists going abroad each year for formal degree-level or project-based training is unknown. The government's training efforts have, however, had a noticeable effect in recent years. The total number of fte researchers with PhDs in the 26 government agencies combined rose from 145 in 1996 to 228 in 2003, and the number of MSc holders increased from 66 to 350. The overall share of research staff with postgraduate degrees at the government agencies rose from 15 to 29 percent. Degree levels of research staff employed at Vietnam's higher education agencies showed an increasing trend over time as well. In 1996 48 percent of research staff held a postgraduate degree, and by 2003 this share had risen to 66 percent. These shares are relatively low compared with the higher-education sectors in most other countries in the region. Research staff at HAU were significantly more qualified than staff at the country's other universities. HAU is the best-equipped agricultural university in Vietnam, and it therefore attracts the most highly qualified staff.

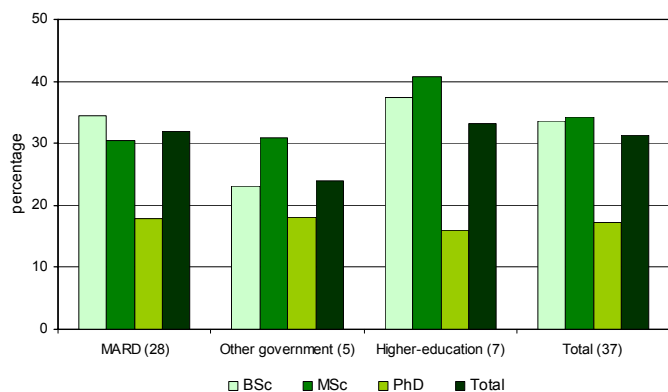
Presently, the national government actively supports training for MARD research staff abroad. Currently, one-third of researchers at FSIV, for example, have a degree from a foreign

university (mainly from Belgium and Germany). Increasing numbers of PhD candidates from Vietnam are being trained in Australia, the United Kingdom, and the United States. Yet the foreign language skills of many MARD researchers—an absolute prerequisite for being able to study overseas—form an important impediment to studying abroad. English-language education was non-existent in Vietnam until the political reforms of the late 1980s, and since then it has been limited for many MARD research staff.

An alarming trend is that many of the most experienced and highly qualified researchers are approaching retirement age. Therefore, senior staff who have both wide experience in the diverse needs of the agricultural sector and high-level qualifications in modern science need to be identified as soon as possible and prepared to replace those who will leave (MARD-FAO 2001).

Despite a rise in the number of women pursuing scientific careers, females still tend to be underrepresented in senior scientific and leadership positions worldwide (Sheridan 1998). Vietnam is no exception. In 2003 31 percent of Vietnam's total fte researchers in a 40-agency sample were female, ranging from 17 percent of those holding doctorate degrees to 34 percent of all researchers trained to the MSc and BSc level (Figure 4). The five government agencies under the Ministry of Fisheries and the Ministry of Industry employed a smaller share of female researchers (24 percent) than MARD (32 percent) and the higher education agencies (33 percent).

Figure 4—Share of female researchers, 2003

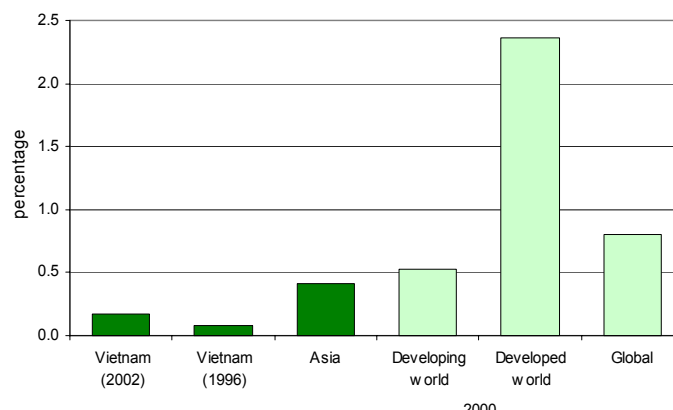


Source: Compiled by authors from ASTI survey data (IFPRI-MARD 2004–05).
Note: Figures in parentheses indicate the number of agencies in each category.

Spending

Total public spending as a percentage of agricultural output (AgGDP) is a commonly used indicator for making international comparisons of agricultural R&D spending. In 2002 Vietnam invested \$0.17 for every \$100 of agricultural output, up from just \$0.08 in 1996 (Figure 5). Vietnam's research intensity has been low compared with most other Asian countries, which have lower ratios on average than the rest of the developing world. Vietnam's ratio was well below the equivalent 2000 ratios for the Asia-Pacific region (0.41) and the developing world (0.53) (Pardey et al. 2006).

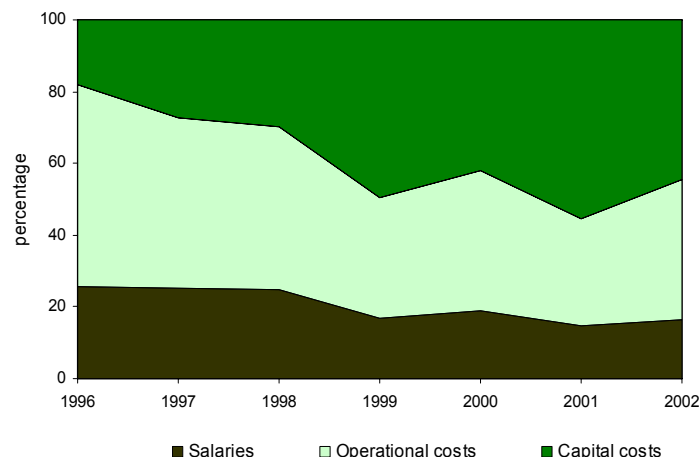
Figure 5—Vietnam's public agricultural research intensity compared regionally and globally



Sources: Vietnam data are compiled from Figure 2; AgGDP data are from World Bank (2005); all other intensity ratios are from Pardey et al. (2006).

During 1996–2002 salaries accounted for an average of 19 percent of total expenditures of a sample of 28 government agencies (Figure 6). Operating costs represented 39 percent of the total, and capital costs, 42 percent. Compared with salaries in many other countries in Southeast Asia, salary levels in Vietnam are extremely low.^{10, 11} As a result, salaries account for a relatively low share of total R&D spending for Vietnamese government agencies, and combined operating and capital spending has a much higher share of spending in Vietnam than in most countries in the region. Although significant spending on operating and capital costs is appropriate, these high shares actually just represent much-needed regaining of lost ground. The share of capital spending in total expenditures increased during 1996–2002, whereas salary and operating expenditures showed a steady decline.

Figure 6—Cost-category shares in expenditures of 28 government agencies, 1996–2002

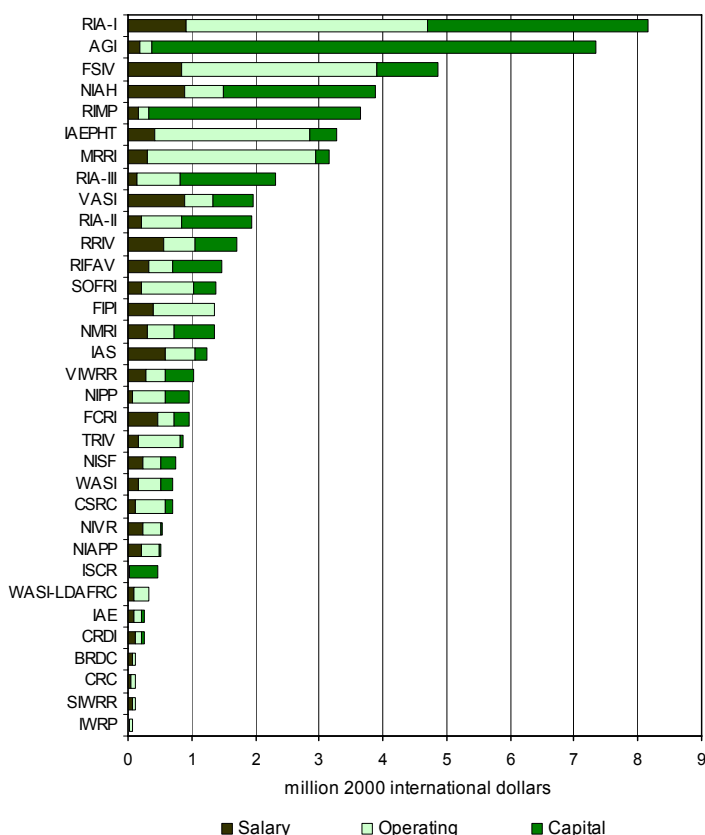


Source: Compiled by authors from ASTI survey data (IFPRI-MARD 2004–05).
Note: Figure excludes five government agencies for which data were unavailable.

As mentioned previously, total spending levels vary widely between the various Vietnamese government R&D agencies. Only seven agencies spent more than \$3 million (in 2000 international prices) in 2002 (Figure 7). RIA No. 3 spent \$2.3 million. Nine agencies spent between \$1 million and \$3 million.

The remaining 16 agencies all spent less than \$1 million. The cost category shares also varied widely between the 33 government agencies. Capital spending was higher than 90 percent at AGI, ISCR, and RIMP in 2003, when these agencies constructed new laboratories and research facilities. The Mekong Rice Research Institute (MRRI), TRIV, IAEPHT, and FIPI all spent more than 70 percent of their total 2003 funds on operating costs, whereas salary costs represented more than 50 percent at SIWRR and BRDC.

Figure 7— Government agency expenditures by cost category, 2002



Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).
Note: Data for ISCR are for 2001.

FINANCING PUBLIC AGRICULTURAL R&D

Over the past decade, funding for agricultural research in Vietnam came from a number of sources—principally the national government (through MARD, MOSTE, and the provincial governments), foreign donors, and internally generated resources. As the national government tries to meet its agricultural growth targets, it has become increasingly committed to financing agricultural R&D.

Research activities at the seven universities receive financial support from MOET (through MOSTE) and a variety of other sources, including bilateral donor projects. HAU's regular operating budget, for example, is financed by MOET. Collaborative projects between the universities and the MARD research agencies are generally co-financed by MOSTE and MARD, based on the submitted project proposals. Additional funds are obtained through joint research projects financed by

foreign donors, including the Belgian Development Corporation, the Danish International Development Agency (DANIDA), the Ford Foundation, and the Japan International Cooperation Agency (JICA). The latter financed a 778 million yen project (roughly US\$6 million) during 1998–2003 for the improvement of HAU's educational and research quality (JICA 2005).

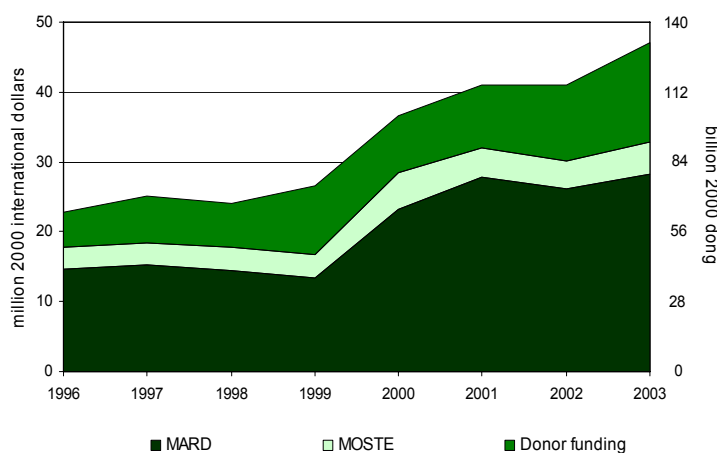
The aquaculture institutes and RIMP received the bulk of their financial support from the Ministry of Fisheries. Some funds to these agencies are allocated through the MOSTE-controlled national fisheries programs (similar to the MARD funding system discussed in the following section). In addition, DANIDA (in collaboration with the Swedish International Development Cooperation Agency [Sida]) financed important projects at the aquaculture institutes through the Fisheries Program of the Mekong River Commission for Sustainable Development (MRC). This program has greatly enhanced national fisheries agencies' capacity to undertake fundamental fisheries research (MRC 2005). Other donors to the aquaculture institutes include the Swiss–AIT–Vietnam (SAV) Management Development Programme, the Norwegian Agency for Development Cooperation (NORAD), the United Nations Development Program (UNDP), and ACIAR.

Agencies under the Ministry of Agriculture and Rural Development

The core funding for MARD's system of agricultural research agencies is provided by the Ministry of Finance out of general funds, through a budget process involving MOSTE. The Treasury transmits funds for salaries, overhead, and equipment directly to MARD, which then transmits these funds to the institutes. Within MARD, DSTQC consolidates the proposals of the different institutes and prepares the budget request, which it forwards to MOSTE. After revision and approval by MOSTE, the resources are then channeled to MARD's Department of Finance and Administration (DFA), which distributes the funds to the individual institutes. DFA exercises administrative (but no scientific) control over the use of the resources. DSTQC is responsible for ensuring the quality of the proposals and for detecting and eliminating overlap or duplication. Besides funds paid through MARD, significant amounts are allocated through national agricultural research programs (currently 14) controlled by MOSTE (MARD-FAO 2001). During 1996–1999, the 27 agencies under MARD included in our sample reported average annual funding amounts of roughly \$14 million per year from MARD (Figure 8). After this period annual MARD contributions increased rapidly and reached \$28 million in 2003. Total annual MOSTE funding was much lower. During 1996–2003, financial support from MOSTE to the MARD agencies showed an upward trend from \$3.0 million to \$4.7 million.

Exact amounts of funding through sources other than MARD, MOSTE, and foreign donors were not available. Funding from public/private enterprises and internally generated resources, however, play a small but significant role in financing research activities of certain MARD agencies. CRC, for example, received roughly 5 percent of its total funds from coffee producers in 2003. In addition, during the same year, agencies like FSIV and the Southern Fruit Research Institute (SOFRI) generated between 5 and 10 percent of their total funds internally.

Figure 8—MARD, MOSTE and donor funding for 27 MARD-agencies (in fte's), 1996-2003



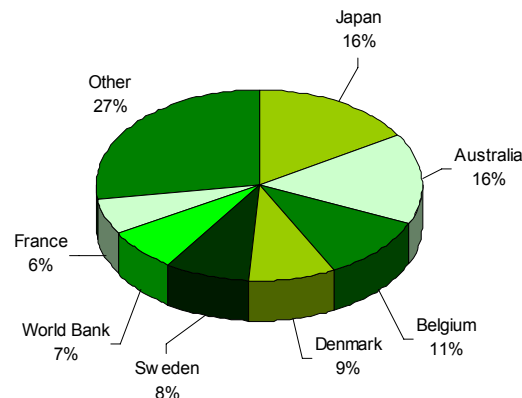
Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).
Notes: Figure excludes FCRI. Total donor funding figures for 2002–03 have been extrapolated using the donor funding trend for 19 MARD agencies for which data were available. Exact amounts for other sources of funding (including public/private enterprises, internally generated resources, producer/marketing boards) were not available, and are therefore excluded from this figure.

Donor funding also represents an important share of total financing to the MARD agencies. In the 1980s the Soviet Union and the Eastern Bloc countries were the principal donors to agricultural R&D in Vietnam. The Soviet Union helped Vietnam create several research institutions. Other donors included France, the Netherlands, and various agencies under the United Nations (Göhl and Nguyen 1990). During 1996–2003 total donor contributions rose gradually from \$5 million to an estimated \$14 million. Certain MARD agencies relied much more heavily on donor funding than others. NIAH, for example, received a quarter (\$13 million) of combined donor funding to all MARD agencies during 1991–2001. Over the past 15 years Sweden has been a consistent donor to NIAH. Other important donors to the institute, who have financed research projects as well as the provision of equipment, include JICA, CIRAD, ACIAR, and FAO. Donors also provided an important share of funding for the Southern Fruit Research Institute (SOFRI), IAS, and SIWRR. IAEPHT reported receiving significant funds from the United States Department of Agriculture (USDA) for research on pesticide residues. JICA is an important donor to FSIV. This Japanese agency currently finances projects in the institute's Mekong Delta plantation and the rehabilitation of degraded natural areas. Other donors to FSIV include the governments of Australia, the Netherlands, and Sweden, the Center for International Forestry Research (CIFOR), the Asian Development Bank (ADB), and the World Bank. Many other MARD agencies (such as WASI, TRIV, IAE, and FCRI), on the other hand, did not receive any donor funding during 1991–2001. The agencies themselves are responsible for mobilizing donor support, and MARD does not interfere in the relationships between research agencies and donors, except in the case of loans from the World Bank and ADB. Loans from these banks (mostly for policy reform or strategic studies) typically support agricultural R&D activities at the ministry level.

The contributions from the top five donors (Japan, Australia,

Belgium, Denmark, and Sweden) represented nearly 60 percent of total donor funding to MARD agencies during 1991–2001 (Figure 9).¹² JICA was the largest donor to MARD agencies during 1991–2001. Although JICA financed 19 individual projects during this period, the bulk of JICA's support went to two projects: Capacity Strengthening for Artificial Insemination for NIAH and Capacity Strengthening for Disease Diagnosis for NIVR.

Figure 9—MARD donor funding by donor, 1991-2001



Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).

Australia is also an important donor to agricultural R&D in Vietnam. ACIAR's Vietnam program includes not only training and capacity building in agriculture, but also R&D and extension. During 1991–2001 the MARD agencies received US\$7.3 in support from ACIAR. Although most of ACIAR's program is currently based in greater Ho Chi Minh City and Hanoi (where most agricultural R&D agencies are based), in 2004 it agreed to place a greater emphasis on the central coastal regions of Vietnam. ACIAR will also play a role in getting the private sector and nongovernmental organizations (NGOs) more involved in agricultural projects, increase its linkages with other R&D activities and donors, and improve links between Vietnam's research and extension organizations (ACIAR 2005).

Part of Australia's overall aid to Vietnam is the Collaboration for Agriculture and Rural Development (CARD) project, funded by AusAID. This six-year, A\$19.5 million (approximately 231 billion current dong, or US\$14.6 million) program was announced in March 2004 after a three-year pilot program. In early 2005 12 agricultural research projects were approved for the first phase of CARD. These projects have a combined total cost of A\$5.5 million, of which A\$3.5 million is provided by CARD. The remainder is provided through counterpart funding from collaborating agencies in Australia and Vietnam. All projects will last two to three years and encompass a variety of research activities aimed at improving fruit and vegetable production, fish farming, irrigation, marketing and agribusiness services, forest plantation, control of cattle diseases, and postharvest methods. The research is conducted jointly between Vietnamese government and higher-education agencies and Australian partners (AusAID 2005).

Future of MARD funding

Despite the rapid increases in total funding to MARD research agencies in recent years, the Vietnamese government is aware that funding for the country's agricultural research activities is still too low and is consequently committed to bringing its investments in agricultural R&D up to par with other Asian countries. As part of its medium-term program for 2001–10, the national government has committed itself, in partnership with ADB and the World Bank, to increase its agricultural R&D budget by at least 12 percent annually. It also announced that it aimed to achieve an agricultural research intensity ratio of 0.51 percent by 2005 (MARD-FAO 2001). Given the country's 2002 ratio of 0.17, agricultural R&D investments should have tripled during 2002–05 under the assumption of stable AgGDP levels. This goal therefore appears to have been rather ambitious. MARD's budget did rise by 12 percent annually in current prices during 2002–05. However, when expressed in constant prices, this increase was much smaller.

In February 2006, the Vietnamese government approved a plan to spend one trillion current dong (US\$63 million) on agricultural biotechnology over the next 15 years. Under this plan, Vietnam will research and develop vaccines and genetically modified crops and livestock. A part of the funding will be reserved for the training of scientists (Science and Development Network 2006a).

The Vietnamese government is considering other policies to increase future funding and promote new funding sources. It has attempted, for example, to transfer research on commercial crops to state-owned enterprises. This approach has turned out to be difficult, however, in part because many state-owned enterprises are unwilling to bear the full cost of the research. Nevertheless, RRIV was transferred to the Vietnam Rubber Corporation in September 2005. MARD has also attempted to mobilize greater contributions for agricultural R&D from various social and economic institutions (at the provincial and district levels), as well as from communes, households, and individuals who directly benefit from the research outcomes. The national government is also encouraging research agencies to increase their reliance on funding from internally generated resources. More and more MARD agencies sell their produce and technologies on the market, and individual researchers increasingly undertake consultancy jobs with outside parties in order to finance research projects at the MARD agency for which they work. The government is also considering the introduction of a commodity cess (levy) system. A cess would be imposed on the export of certain agricultural goods (notably coffee, rubber, tea, fruits, cashew nuts, and rice), and the proceeds would be earmarked for research on these respective crops.

RESEARCH ORIENTATION

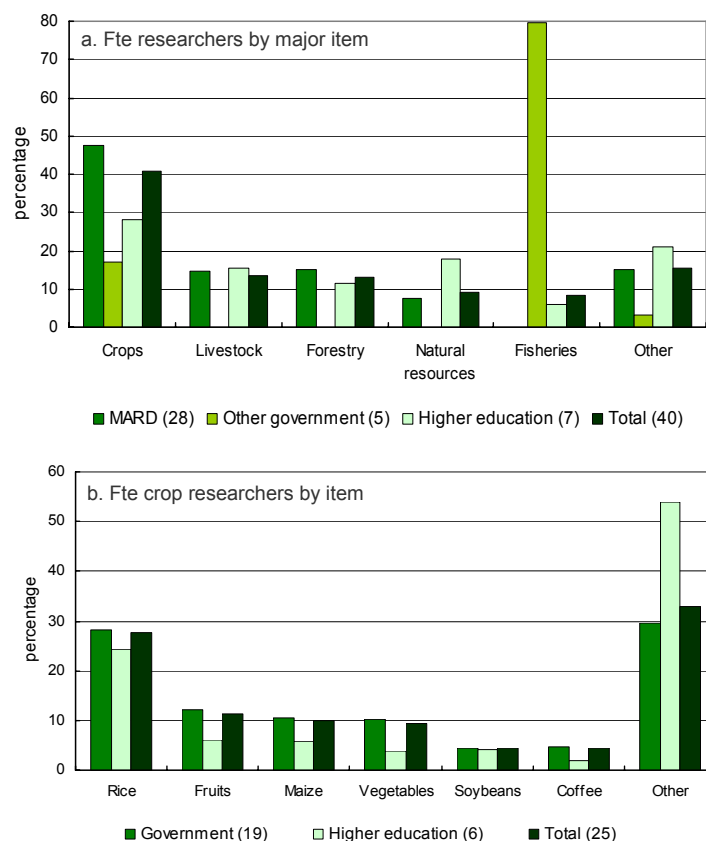
Commodity Focus

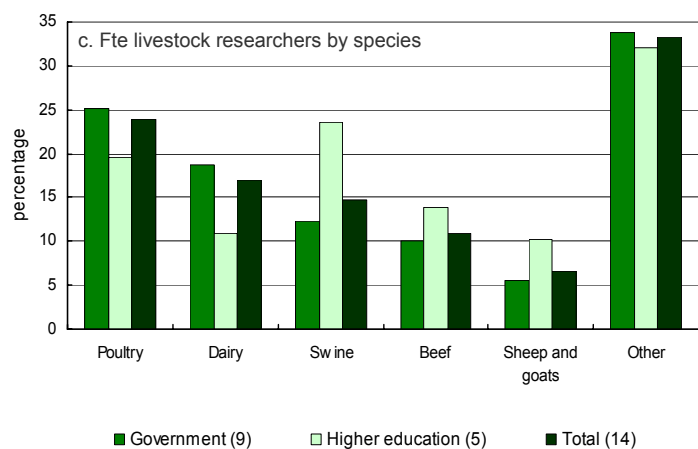
The allocation of resources across various lines of research is a significant policy decision; hence the survey collected detailed information on the number of fte researchers working in specific commodity and thematic areas.

In 2003 more than 40 percent of Vietnam's agricultural research staff conducted crop research. Livestock research accounted for 14 percent; forestry research, 13 percent; natural

resources research, 9 percent; and fisheries research, 8 percent (Figure 10a). Research staff at the MARD agencies spent more time on crop and forestry research than did their counterparts at the other government and higher-education agencies, which is not surprising given that four of the five agencies under the category "other government" are under the Ministry of Fisheries. The most researched crop is rice, accounting for 28 percent of total crop research (Figure 10b). Fruits accounted for 12 percent, and maize and vegetables for 10 percent each. The remaining 50 percent of the crop researchers focused on a variety of other crops, including coffee and soybeans. Most livestock researchers focused on poultry (24 percent) and dairy (17 percent) (Figure 10c). Other livestock themes included swine, beef, and sheep and goats. Two-thirds of Vietnam's livestock research was conducted by NIAH, the principal veterinary research agency in the country.

Figure 10—Commodity Focus, 2003





Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).
Notes: Figures in parentheses indicate the number of agencies in each category. Figure 10b only includes agencies involved in crop research; Figure 10c only includes agencies involved in livestock research.

Thematic Focus

In 2003 19 percent of researchers at the 33 government agencies worked on crop genetic improvement, 9 percent on livestock genetic improvement, and 8 percent on natural resources other than water and soils (Table 2). The remainder of the researchers at these agencies focused primarily on other crop and livestock themes. The major theme at the higher-education agencies was water (17 percent), which reflects the importance of WRU in our sample of agencies. Other important themes in the higher-education sector were crop genetic improvement and other crop areas (excluding pest and disease control).

Table 2—Thematic focus, 2003

Category	Numbers of researchers		Shares	
	Government (33)	Higher education (7)	Government (33)	Higher education (7)
	(in fte's)		(percent)	
Crop genetic improvement	441.1	65.6	18.6	11.3
Crop pest and disease control	136.9	28.7	5.8	4.9
Other crop	393.8	65.7	16.6	11.3
Livestock genetic improvement	220.1	13.1	9.3	2.3
Livestock pest and disease control	61.6	27.3	2.6	4.7
Other livestock	178.4	57.2	7.5	9.8
Soil	88.2	27.9	3.7	4.8
Water	84.3	101.1	3.6	17.4
Other natural resources	195.7	20.8	8.3	3.6
Postharvest	83.6	11.3	3.5	1.9
Other	485.2	163.0	20.5	28.0
Total	2368.9	581.7	100.0	100.0

Source: Compiled by authors from ASTI survey data (IFPRI–MARD 2004–05).
Note: Figures in parentheses indicate the number of agencies in each category.

CONCLUSION

Agricultural researcher totals in Vietnam increased steadily during 1991–2003, reaching nearly 3,000 fte's in 2003. The country's agricultural R&D expenditures almost tripled throughout 1996–2002 as a result of an increased commitment by the national government to financing agricultural research, as well as a rise in donor support. Nonetheless, average expenditures per researcher and research intensity levels are still lower than in many of Vietnam's Southeast Asian neighbors. With the launch of its medium-term program for 2001–10, the national government announced that it intended to attain an agricultural research intensity ratio of 0.51 percent by 2005. In view of the country's low 2002 ratio (0.17 percent) and modest growth in R&D spending in real terms during 2002–05, this goal appears to have been somewhat overoptimistic. Nonetheless, the approval of large-scale investments in biotechnology research by the Vietnamese government in February 2006 certainly underlines the government's commitment to reaching this goal.

Besides relatively low investment levels, agricultural research in Vietnam is characterized by low qualification levels of research staff, a legacy of the country's political isolation. Since the country's political and economic reforms, rapidly increasing numbers of scientists have been trained abroad to the MSc and PhD level, significantly boosting average degree levels in recent years.

In 2005 MARD-led R&D underwent a major reshuffling, in which the total number of MARD agencies with a research mandate was reduced from 28 to 12. Another round of mergers is expected to halve this total again by 2008. These amalgamations aim to eliminate duplication of research efforts between the various MARD agencies, but they do not appear to address the extreme geographic centralization of Vietnamese agricultural R&D, with most activities still taking place in the immediate vicinity of Hanoi (and to a lesser extent Ho Chi Minh City). This situation prevents R&D from being closely connected with Vietnam's rural development programs.

NOTES

1. The authors are grateful to numerous colleagues in Vietnam for their time and assistance with the data collection, and thank Nienke Beintema, Dang Vu Binh, Do Viet Trung, Nguyen Quang Trung, and Nguyen Van Bo for their useful comments on previous drafts of this brief. The authors would also like to express their gratitude to the Asia Pacific Association of Agricultural Research Institutions (APAARI) for facilitating the ASTI survey in the Asia-Pacific region.
2. The 41-agency sample consisted of:
 - 33 government agencies/units: the National Institute of Animal Husbandry (NIAH), the Forest Inventory and Planning Institute (FIPI), the Institute of Agricultural Engineering and Post-Harvest Technology (IAEPHT), the Forest Science Institute of Vietnam (FSIV), the Vietnam Agricultural Science Institute (VASI), the Agricultural Genetics Institute (AGI), the Ba Vi Coffee Research Center (CRC), the Food Crops Research Institute (FCRI), the Institute of Agricultural Science in the South (IAS), the Institute of Sugarcane Research (ISCR), the Mekong Rice Research Institute (MRRI), the National Institute of Plant Protection (NIPP), the National Institute for Soils and Fertilizers (NISF), the National Maize Research Institute (NMRI), the Research Institute of Fruits and Vegetables (RIFAV), the Rubber Research Institute of Vietnam (RRIV), the Southern Fruit Research Institute (SOFRI), the Tea Research Institute of Vietnam (TRIV), the Western Highlands Agro-Forestry Science and Technology Institute (WASI), the Lam Dong Agro-Forest Research Center (LDAFRC), the National Institute of Veterinary Research (NIVR), the Vietnam Institute for Water Resources Research (VIWRR), the Southern Institute of Water Resources Research (SIWRR), the Institute of Water Resources Planning (IWRP), the Bee Research and Development Center (BRDC), the Central Sericulture Research Center (CSRC), the National Institute for Agricultural Planning and Projection (NIAPP), the Institute of Agricultural Economics (IAE); the Research Institutes of Aquaculture (RIA) No. 1, No. 2, and No. 3, the Research Institute of Marine Products (RIMP), and the Cotton Research and Development Institute (CRDI);
 - 7 higher-education agencies: the University of Agriculture and Forestry of Ho Chi Minh City, the Hue University of Agriculture and Forestry, the Hanoi Agricultural University, the Thai Nguyen Agro Forest University, the Faculty of Agriculture of the University of Can Tho, the Vietnam Forestry University, and the Water Resources University; and
 - 1 private enterprise: East-West Seed Vietnam.

This sample excludes two higher-education agencies (the agricultural faculties of Hong Duc University and Dong Thap University) and an unknown number of private-sector agencies for which data were unobtainable.
3. Unless otherwise stated, all data on research expenditures are reported in 2000 international dollars or in 2000 Vietnamese dong.
4. The Center for Agricultural Machinery Testing (CAMT), the Information Center of Agriculture and Rural Development (ICARD), the National Center for Inspection of Drugs and Bio-Products (NCIDB), and the National Center for Variety Evaluation and Seed Certification (NCVESC) are excluded from our survey sample, as these agencies do not have an agricultural research mandate. These agencies are involved in planning and projection, testing, evaluation, certification, and information.
5. Unless otherwise stated, all staff figures in this brief are for 2003; all spending figures are for 2002.
6. As of September 2005 12 agricultural R&D agencies were placed under MARD: the Vietnam Academy of Agricultural Sciences (VAAS), the Highland Agricultural Research Institute (HARI), the Institute of Agricultural Policy and Strategy (IAPS), FSIV, VIWRR, NIAH, NIVR, IAEPHT, SIWRR, IAS, MRRI, and SOFRI.
7. IAS, MRRI, SOFRI, and HARI will be incorporated into VAAS. SIWRR will be integrated into VIWRR. NIAH and NIVR will merge into the Animal Husbandry and Health Research Institute (AHHRI). FSIV, IAEPHT, and IAPS will continue to exist as separate entities.
8. CRDI was moved from the Vietnam Cotton Corporation to the Vietnam National Textile and Garment Corporation (VINATEX) of the Ministry of Industry in November 2004. VINATEX was established as a merger of all centrally state-owned textile and garment enterprises. The Ninh Thuan Province-based agency plays several different roles as manufacturer, exporter, importer, and distributor for textiles and garments on both a wholesale and a retail basis.
9. The two omitted higher-education agencies reportedly conduct minimal agricultural research; with their inclusion, these totals would be slightly, though not substantially, higher.
10. Given that salaries in Vietnam are extremely low compared to many other Asian countries, MARD actively encourages personnel to pursue contracts with other organizations or international co-operation agencies (MARD-FAO 2001).
11. Vietnamese scientists at government agencies could receive enormous salary rises under a proposal by the Ministry of Science in February 2006. Salaries for a limited number of scientists selected to take part in a pilot scheme will increase to US\$1,000-US\$2,000 per month. Currently, these scientists are paid at the same rates as other civil servants, whose monthly salary averages US\$65. This salary increase could help curb the flow of Vietnamese scientists abroad or to positions with foreign companies (Science and Development Network 2006b).
12. Detailed information on donor funding was available only for the period 1991–2001.

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METHODOLOGY

- Most of the data in this brief are taken from unpublished surveys (IFPRI and MARD 2004-05).
- The data were compiled using internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 2002; UNESCO 1984). The authors grouped estimates using three major institutional categories—government agencies, higher-education agencies, and business enterprises, the latter comprising the subcategories private enterprises and nonprofit institutions. The researchers defined public agricultural research to include government agencies, higher-education agencies, and nonprofit institutions, thereby excluding private enterprises. Private research includes research performed by private-for-profit enterprises developing pre, on, and postfarm technologies related to agriculture.
- Agricultural research includes crops, livestock, forestry, and fisheries research plus agriculturally related natural resources research, all measured on a performer basis.
- Financial data were converted to 2000 international dollars by deflating current local currency units with a Vietnamese GDP deflator of base year 2000 and then converting to U.S. dollars with a 2000 purchasing power parity (PPP) index, both taken from World Bank (2005). PPP's are synthetic exchange rates used to reflect the purchasing power of currencies, typically comparing prices among a broader range of goods and services than conventional exchange rates.
- Annual growth rates were calculated using the least-squares regression method, which takes into account all observations in a period. This results in growth rates that reflect general trends that are not disproportionately influenced by exceptional values, especially at the end point of the period.

See the ASTI website (<http://www.ASTI.cgiar.org>) for more details on methodology.

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ABOUT THE AUTHORS

Gert-Jan Stads < g.stads@cgiar.org > is a consultant for the Agricultural Science and Technology Indicators (ASTI) initiative under the ISNAR division of IFPRI. Nguyen Viet Hai < nvhai.khen@mard.gov.vn > is Secretary for the AgriEconomic Policy and Marketing Division of MARD.

CONTACT ASTI INITIATIVE <http://www.asti.cgiar.org>

Nienke Beintema, Head ASTI initiative < ASTI@cgiar.org >

International Food Policy Research Institute (IFPRI)

2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
Phone +1 (202) 862-5600
Fax +1 (202) 467-4439

<http://www.ifpri.org>